

## A REVISIONARY STUDY OF PHEIDOLE VASLITI PERGANDE (HYMENOPTERA: FORMICIDAE)

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During the period from 1950 to 1953 the writer observed a large number of colonies belonging to the *vasliti* complex in southern Arizona and Mexico. Samples from these colonies brought home for further study have indicated that the existing taxonomic structure of the complex is not altogether satisfactory. Much of this trouble results from the variable color of these insects, which cannot be correlated with distribution or even with differences in nest sites. But after it had been determined that the named color varieties in this complex have no distributional significance, a serious difficulty still remained. This is the exact nature of Pergande's species *vasliti*.

As is shown in this study, Pergande had a very hazy concept of the character of *vasliti*. It is not surprising, therefore, that those who later worked with this insect based their ideas of *vasliti* on something more tangible, notably Forel's variety *hirtula*. This procedure was not entirely unfortunate, for it can be shown that *hirtula* is a sound species in its own right. Indeed, there is room for the view that the status of *hirtula* has been too sound. Because it is so distinct and so easily recognized, *hirtula* has carried the unrecognizable *vasliti* on its back for nearly sixty years without anyone appreciating the drastic shortcomings of the latter species. It is evident that Forel (1899) believed that he could recognize *vasliti*, for he described *hirtula* as a variety of it. But Forel did not know that the worker caste of *hirtula* is polymorphic until Wheeler sent him nest series from Queretaro in 1900. Forel then realized that the insect which he had previously treated as Pergande's *obtusospinosa* is actually the major of *hirtula*. Then Forel (1901) took characteristic action—he protected his variety *hirtula* by declaring that *obtusospinosa* is the major worker of *vasliti*. In a few years this mistake was recognized and corrected, but Forel's equally mistaken contention that *hirtula* is a variety of *vasliti* has been accepted without question to the present.

W. M. Wheeler (1914) published a paper in this Journal which carried a revision of the *vasliti* complex. Wheeler had seen some, although not all, of Pergande's types. He also had a fairly substantial amount of material from several stations in Mexico and southern Arizona. He was, therefore, in a position to give the best account of the *vasliti* complex which had appeared up to that time. Wheeler showed that the members of the *vasliti* complex are divisible into two distinct groups on the basis of structural differences shown by their respective majors. In one group (*hirtula*, *acolhua*) the head of the major is strongly cordate, because it is narrowed at the level of the insertion of the mandibles. Measurements made by the writer show that the head of such majors has a maximum width of 2.8 mm. and a width at the level of the insertion of the mandibles of 1.8 mm. In addition, neither of the two large apical teeth of the mandibles of such majors is depressed. Because of this the upper surface of the mandible forms an even curve, broken only by a narrow groove between the two apical teeth. In the second group (*subdentata*, *arizonica*) the head of the major is less strongly cordate because it is less constricted at the level of the insertion of the mandibles. In such majors measurements by the writer give the greatest width of the head as 2.8 mm. and the width at the level of the insertion of the mandibles as 2.0 mm. In the mandible of such majors, the outermost of the two apical teeth and the portion of the mandible just behind it are both distinctly depressed. Because of this flattening the upper face of the mandible does not form an even curve but breaks sharply at the inner tooth, descending abruptly to the flattened terminal portion.

There are other important differences which Wheeler did not mention. In the major of *hirtula* the rugae on the occipital lobes and most of the front are very feeble or absent. These areas bear many prominent, elongate, piligerous punctures, between which is a rather feebly granulate surface. In addition there are prominent striae at the base of the mandible and the remainder of the upper surface of the mandible is covered with coarse, piligerous punctures (Plate VI, Fig. 1). In *subdentata* the occipital lobes and the front of the head of the major are covered with delicate, but quite easily discernible, longitudinal rugae. These and the granulose surface between them always obscure

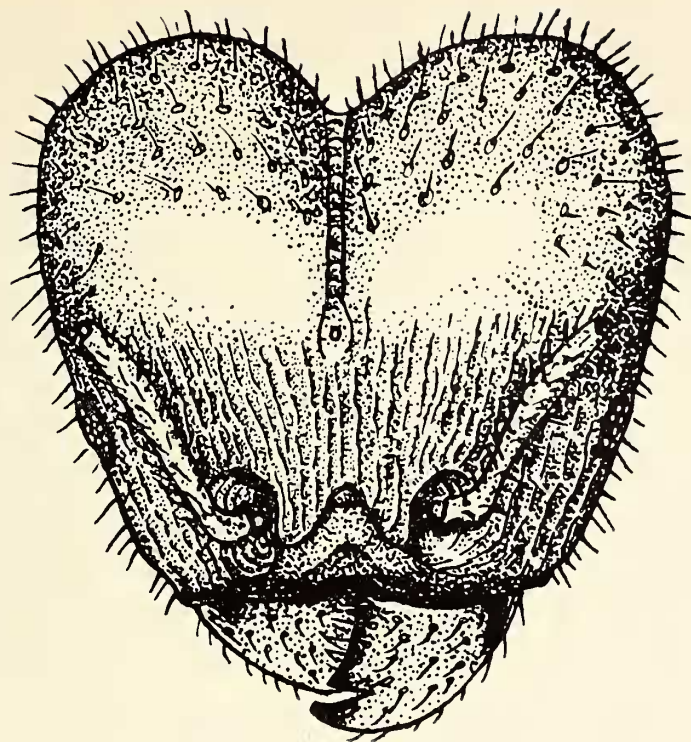


FIG. 1

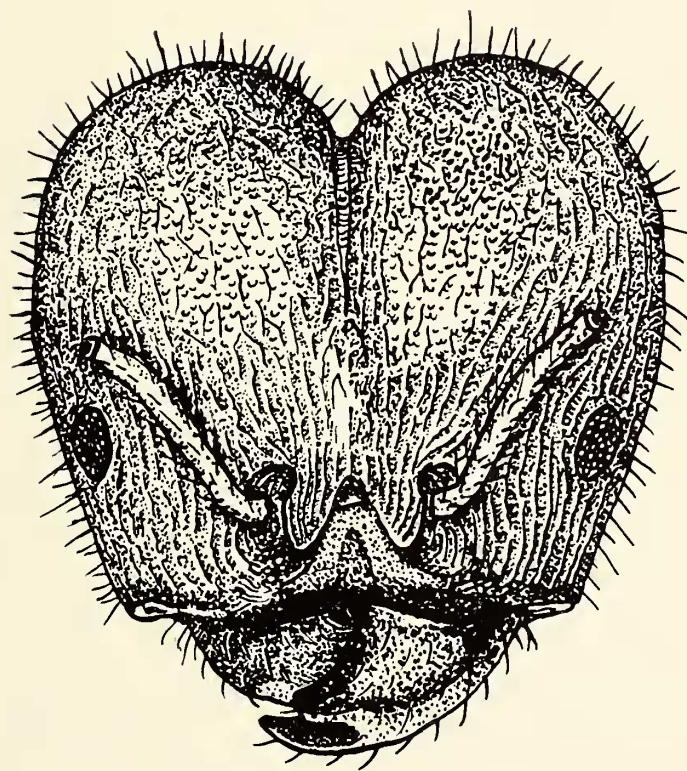


FIG. 2

FIG. 1. Head of the major of *Pheidole hirtula* Forel. Maximum head width 2.8 mm.

FIG. 2. Head of the major of *Pheidole subdentata* Pergande. Maximum head width 2.8 mm.



the piligerous punctures to some extent and often make the punctures difficult to see. The basal striae on the mandibles of such majors are feeble or absent and the upper surface of the mandible bears small, piligerous punctures (Plate VI, Fig. 2). These differences, plus those of dentition, are usually shown by the larger medias as well. They are less clearly shown by the smaller medias (those in which the antennal scapes reach the occipital angles) and not shown at all by the minors. Even so, these distinctions are more serviceable than those based on proportions which change with the size of the worker. It is unfortunate that Wheeler employed two such characters in the key which accompanied his revision. The shape of the head and that of the postpetiole both fall into this category. It is true that Wheeler restricted his key to the major worker but he did not give any measurements by which this caste could be certainly recognized. If distinctions of this sort are to be useful they should be accompanied by a reliable measurement of the size of the worker which shows them.

Wheeler preferred to treat these two populations (*hirtula* and *subdentata*) as subspecies and on this basis he gave the *vasliti* complex the following constitution:

- Ph. vasliti* Pergande
- var. *hirtula* Forel
- var. *acolhua* Wheeler
- subsp. *subdentata* Pergande
- = *obtusospinosa* Pergande
- var. *arizonica* Santschi

It is clear from this arrangement that Wheeler had recognized Forel's error in treating *obtusospinosa* as the major of *vasliti*, but it is equally clear that he did not question Forel's view that *vasliti* and *hirtula* are essentially the same; nor did Emery (1921), who used Wheeler's arrangement in the Genera Insectorum. The only alteration to the above plan which has been suggested is that of the writer, (1950), who treated *arizonica* as a subspecies. I now know that this treatment is incorrect, for *arizonica* cannot be separated from *subdentata*.

The material which the writer collected in Mexico and southern Arizona falls readily into one or the other of the above groups. The definitive structural features which separate these groups

are maintained with high constancy throughout the entire range of each population. Moreover, these ranges appear to be entirely separate. The eastern population which, for reasons to be explained later, will have to be called *hirtula*, is primarily a Plateau species. Its range begins in northern Chihuahua and runs southwards through Coahuila, Durango, Nuevo Leon, San Luis Potosi and Zacatecas to Hidalgo, Queretaro and Jalisco. The vertical range of this species extends from 3500 to 7600 feet but the majority of the records occur between the 5000 foot and 7000 foot levels. Along the Sierra Madre Oriental, *hirtula* occasionally occurs east of the crest of the mountains, but always at considerable elevations. On the western side of the Plateau it never gets near the crest of the Sierra Madre Occidental, apparently because its inability to tolerate elevations in excess of 7600 feet restricts it to lower levels on the eastern slopes of the Sierra. The fully developed nests of *hirtula* are very populous with many majors present, and it occasionally dominates an area to the exclusion of most other ground-dwelling ants. The marriage flight has not been observed but, since the sexual castes appear in the nests as early as April and remain in them until the middle of August, it seems probable that the marriage flight occurs in late August or early September.

The distribution of the western population, *subdentata*, is not as well known. It occurs at elevations up to 6300 feet in many of the mountains in southern Arizona. It apparently does not occur on the Sonoran coastal plain but is present in some of the hills which border the inner edge of this plain. Under such conditions its elevational range may descend to 1000 feet or a little less. Since the types of *subdentata* come from Tepic, in Nayarit, it seems safe to assume that this insect occurs in the western foothills of the Sierra Madre Occidental through southern Sonora and Sinaloa. The colonies of *subdentata* are also large but the number of majors in a colony is much smaller than in the nests of *hirtula*. While the number of *subdentata* nests in an area is often quite large, this species never seems to exclude other ants from such areas. The marriage flight of *subdentata* occurs in early July in southern Arizona.

It should be apparent from the foregoing discussion that *hirtula* and *subdentata* differ not only in the structure of the

major but also in a number of other ways as well. The problem is not to defend the separate specificity of these two insects but rather to show what relationship they have to the virtually unknown *vasliti*. The types of *vasliti* were taken in the Sierra San Lazaro, a small range at the southern tip of Baja California. It seemed to me, therefore, that on the basis of distribution it was more logical to expect that they should be related to *subdentata* than to *hirtula*. The only way to test this was to examine Pergande's types of *vasliti*. I was enabled to do this through the courtesy of Dr. M. R. Smith who arranged matters so that I was able to study all the type material of *vasliti* at present in the collection of the U. S. National Museum. The importance of these types to this work cannot be overestimated and I am happy to thank both Dr. Smith and the National Museum for the privilege of examining them.

In Pergande's (1895) original description of *vasliti* (which he described as *vaslitii*) he notes that the species was based on 9 soldiers and 13 workers. There are now in the collection of the National Museum 13 specimens of this series consisting of 6 majors and 7 minors. Because of what is to follow it is necessary to discuss the labeling of these specimens, for this is not uniform. Eleven of the specimens (4 majors and 7 minors) bear Pergande's hand written locality label, "Sierra San Lazaro, Cape region, L. Cal., Mex.". The ink on these labels has faded to a brownish tint and the paper of the label is slightly yellowed. Below the locality label is a printed label "Collection T. Pergande." Two of these specimens (1 major and 1 minor) bear an identification label also written by Pergande and also in the same faded ink. Each of these labels carries the notation "*Pheidole vaslitii* n. sp." In the lower left-hand corner of the label is the word "Type" in the lower right-hand corner is the word "Perg.".

The other two specimens (both majors) are differently labeled. In each the locality label is hand written and the writing is, apparently, that of Pergande. But neither the ink nor the paper of the label has faded and the locality is given as "Sierra S. Lazaro, Mex.". In place of the printed collection tag each specimen bears a red type label marked "Type No. 4488 U.S.N.M." One of the specimens has an identification label, again in Pergande's writing, which reads "*Pheidole vaslitii*."



The word "Perg." occurs in the lower right-hand corner of this label and also in the lower left-hand corner, where it occupies the space marked "Type" in the other labels. Dr. Smith informs me that Pergande noted in the type book of the National Museum that he had marked three specimens of *vasliti* as types. It would appear that when he did so he altered the locality labels of these three specimens, probably because he realized that the original labels were not holding up as well as might have been wished.

The importance of the above data will be appreciated when it is realized that there are four different species present in the 13 specimens from the type series of *vasliti*. These are as follows: (1). Four majors (one marked as the type of *vasliti*) are the insect which W. M. Wheeler described in 1908 as *Ph. cockerelli*. There can be no doubt whatever about this nor, in my opinion, is there room for doubt that these four specimens were the source of Pergande's description of the major of *vasliti*. They agree in every particular with his description, even to the two faint longitudinal grooves which Pergande stated were present on the dorsum of the postpetiole.

(2). Three minors (one marked as the type of *vasliti*) are Wheeler's *crassicornis tetra* which was also described in 1908. These workers have a quadrate head with an almost straight posterior border. They are sparsely provided with short erect hairs and have acute, erect epinotal spines. They seem to have furnished Pergande with some of the features included in the description of the minor of *vasliti*.

(3). Four minors (none marked as a type of *vasliti*) appear to be Emery's *Ph. hyatti*. These minors are clearly the main source of Pergande's description of the minor of *vasliti*. Their heads are elongate, with the convex sides passing to the curved occipital border through very much rounded angles. Most of the thorax is densely granulated and there are feeble transverse rugae present on the pronotum. They are abundantly provided with long erect hairs. The epinotal spines are slender but slope to the rear.

(4). Two majors each bearing the U.S.N.M. type label No. 4488 are the most puzzling of the lot. One of these specimens is badly damaged, both the head and thorax having partially collapsed. The light color of this specimen indicates that it was a callow

and the damage is probably the result of drying. Both these specimens are unusually hairy, with many short hairs of equal length interspersed with longer hairs present on the head and thorax. In both specimens the mandibles are highly shining, without a trace of striae and with sparse, small punctures. In both specimens the antennal scapes are slender and the tip of the scape falls just short of reaching the occipital angle. In both specimens the head is slightly longer than broad (1.5 mm.  $\times$  1.4 mm. in the undamaged specimen) with the sides gradually narrowed from the eyes to the insertion of the mandibles. The impression of the occiput is broad and quite shallow. In the undamaged specimen, and presumably in the other one also, prior to the distortion of the thorax, the mesonotum is rounded when seen in profile. The cephalic rugae are coarse and the granulations between them are unusually dense. It appears impossible at present to state what these two specimens are. They may be the medias of a polymorphic species related to *subdentata* or the majors of a dimorphic one related to *hyatti*. But there is no doubt about one thing; neither of them contributed anything to Pergande's description of the major of *vasliti*.

It seems to me that in dealing with this extraordinary tangle it is essential to seek a solution which does the least violence to the existing taxonomic structure of the genus *Pheidole*. If the two specimens marked by Pergande as the types of *vasliti* (U.S.N.M. No. 4488) had been the source of his description of the major of *vasliti*, his action would have been a plain case of lectotypic designation. But since these specimens were not described, Pergande's action in marking them as types can scarcely be considered as the designation of a lectotype. However, I see no reason why I cannot make such a selection, for I have briefly described these specimens in the foregoing paragraphs. I, therefore, designate as the lectotype of *vasliti* the undamaged specimen in the collection of the U. S. National Museum which bears the type number 4488. This action avoids any possibility of name changes in the case of Wheeler's *cockrelli* or *tetra*. It is also true that it leaves us still in the dark as to exactly what *vasliti* is. But since we have managed to do pretty well for half a century with a totally fallacious view as to



the real nature of *vasliti*, I cannot see that we are any worse off now that we are not sure what it is. It is, of course, necessary to provide a name for the eastern population formerly treated as a variety of *vasliti* for, whatever *vasliti* may be, it is not closely related to this population. Since this population was first described as the variety *hirtula*, it is necessary to use *hirtula* as the name for this species. On this basis the *vasliti* complex would have to be arranged as follows:

*Pheidole vasliti* Pergande (lectotype only)

*Pheidole hirtula* Forel

= var. *acollhua* Wheeler (NEW SYNONYMY)

*Pheidole subdentata* Pergande

= *obtusospinosa* Pergande

= var. *arizonica* Santschi (NEW SYNONYMY)

There follow new locality records for *hirtula* and *subdentata*. Unless otherwise stated the records are those of the writer.

*Pheidole hirtula* Forel

CHIHUAHUA: 13 miles west of Chihuahua City (5100')

COAHUILA: Diamante Pass near Arteaga (7200'); 5 miles east of Arteaga (5800'); 2 miles east of Ramos Arizpe (4900')

NUEVO LEON: 4 and 6 miles west of Iturbide (6200')

DURANGO: 5 miles east of San Lucas (6100'); 7 miles east of Durango (6200'); Arroyo el Sauz, 33 miles north of Durango (6200'); Durango City (6200'); 22 miles south of Villa Ocampo (5700'); 10 miles south of Cuencame (6200'); 25 miles south of Durango (6500'); Rio Mimbres, 27 miles west of Durango (7500'); 10 miles west of Durango (7200')

SAN LUIS POTOSI: 15 and 27 miles west of Ciudad del Maize (3400-3500'); 3 miles west of Ventura (5900'); 17 miles west of San Luis Potosi (7600')

ZACATECAS: 11 miles north of Ojocaliente (6900'); 30 miles east of Sombrerete (6900'); 4 miles west of Sombrerete (7500')

HIDALGO: 15 miles west of Jacala (6500')

JALISCO: 5 miles north of Encarnacion (6200'); 16 miles south of Encarnacion (6600'); 5 miles west of Lagos (6000')

F. G. Werner.

*Pheidole subdentata* Pergande

- ARIZONA: Huachuca Mountains: Sylvania Ranch (6300');  
Garden Canyon (5400'); Canello Pass (5300')  
Peloncillo Mountains: Cottonwood Canyon (4800')  
Baboquivari Mountains: Brown Canyon (3600–  
4200')  
Ajo Mountains (OCNM): Alamo Canyon (2200')  
Organpipe Cactus National Monument: Quitoba-  
quito (900')  
Pima County: Total Wreck Mine (4400')  
SONORA: Cibula (3600'); Puerto Gonzalitos (2500')

**Literature Cited**

- FOREL, A. 1899. *Biologia Centrali-Americana* Hym. 3: 65.  
———. 1901. *Ann. Soc. Ent. Belg.* 45: 130.  
WHEELER, W. M. 1914. *Jour. N. Y. Ent. Soc.* 22: 49–51.  
EMERY, CARLO. 1921. In Wytsman *Gen. Insectorum*. Fasc. 174. 101–  
102.  
CREIGHTON, W. S. 1950. *Bull. Mus. Comp. Zool. Harvard.* 104: 192.  
PERGANDE, T. 1895. *Proc. Cal. Acad. Sci., 2nd series.* 5 (5): 883.